STUDY PERFORMANCE REPORT

State: Michigan **Project No.:** F-53-R-13

Study No.: 466 **Title:** Fish community status in Saginaw Bay, Lake Huron

Period Covered: April 1, 1996 to March 31, 1997

Study Objective: To collect growth, abundance and other biological data with which to assess responses of the Saginaw Bay fish community to changing environmental and biological conditions.

Summary: Between 1989 and 1996, 311 trawl tows and 125 gill net sets were performed. Data collection has been standardized among years to allow comparisons. Data was analyzed for trends and as indicators of the effects of management actions and environmental changes. During the seven years of data collection, relative abundance of walleye in the gill-net catch has declined. Similar declines, however, have not occurred in the sport angler catch rate. It is believed that declines in gill-net catch rate are probably due to movement of walleye to the outer bay area and/or due to gear avoidance resulting from increased water clarity. Sampling in 1995 and 1996 was expanded to include more samples from the outer bay and shallow water environments. Although the gill-net catch rate of walleye was a record low in 1996, 17.6% of that catch was yearlings, possibly indicating a moderately strong 1995 year class. Mean age of the walleye population did not change from 1995. Growth of walleye in Saginaw Bay remains excellent, substantially exceeding the average for Michigan in all age categories. Abundance of yellow perch increased greatly in 1996 due partly to increased catch of two year old perch. Yellow perch growth fell below the state average again for all ages except yearlings which improved. Condition, as indicated by relative weight, remained good for walleye and improved some for yellow perch. Trawling indicated the yellow perch recruitment declined from 1995, but remained well above the poor recruitment period of 1992-94. Growth rates of yellow perch caught in the trawl continued to show improvements. No tubenose or round gobies or Eurasian ruffe have appeared yet in the trawl catch. An eight year summary research report is scheduled for summer 1997.

Job 1. Title: Relative abundance and community structure.

Findings: A total of 36 gill net sets were performed in 1996 (Table 1). As in 1995, netting was expanded to explore distributions of certain species between depth and inner versus outer bay environments (Table 2). Comparisons of depth were performed between depths less than 3 meters (shallow) and greater than 3 meters (regular) (Table 3). No significant difference was observed in gill net CPUE between depths for walleye (see Table 4 for a complete list of scientific names for all species mentioned in this report) in both years (Table 3). The gill net CPUE in the outer bay was less than that of the inner bay for walleye, although statistically significant only in 1995 (Table 5). This is not supportive of the hypothesis that lower walleye gill net CPUEs in recent years were due to redistribution of the walleye population towards the outer bay environment. There was no significant difference in the proportion of yearling walleye collected by depth with gill nets. Comparisons of catch by depth will not be continued in 1997, however, the expanded sampling to the outer bay locations will continue.

The overall abundance of walleye in 1996, as indicated by the gill net catch, declined slightly from 1995 to the lowest level since the partial recovery of the species in the 1980s (Table 6). It is unclear if these declines are reflective of true changes of walleye abundance. Trends in the sport fishery have not mirrored these declines until just recently. Based on the expanded sampling, it does not appear that greater concentrations of walleye occur in shallow depths nor the outer bay environments, although those areas were not appreciably sampled prior to 1995 and their usage was not fully known. The continued trends in increased water clarity due to zebra mussel (*Dreissena polymorpha*) colonization may be increasing gear avoidance by walleye.

Analysis of the walleye catch by age indicates two consecutive weak year classes (1992 and 1993) (Table 7). These year classes are now fully recruited to the fishery and may be partially accounting for both declines in the gill net CPUE as well as the sport harvest. The percentage of yearling walleye is one measure of recruitment and was 17.6 % in 1996. This suggests a moderately strong 1995 year class. There has now been two non-stocked years in the alternate year stocking evaluation conducted under Study 468. The year 1993 was not stocked and is weak as a year class. However, the other current weak year class of 1992 was stocked. The second non-stocked year of 1996 will not show in this sampling until 1997. It normally requires several years of alternate year stocking to make any inferences of the value or contribution from stocking. Walleye mean age remained unchanged in 1996 (Table 7).

A total of 30 trawl hauls were performed in 1996 (Table 8). Trawling collected over 36,000 fish. Trawl CPUE is summarized in Table 9. Rainbow smelt, gizzard shad, and alewife CPUE remained low, while trout-perch and Johnny darter CPUE remained high relative to the early 1990's. Yellow perch CPUE declined from 1995, but remained higher than the 1992-94 period. Yellow perch recruitment, as indicated by age-0 CPUE, was also lower than in 1995, but considerably higher than during the 1992-94 period (Table 10). White perch long term trends appear to be cycling back down again in 1996 with a substantial decline in catch rates from 1995 (Table 11). Notably absent from the trawl catch were round gobies as well as Eurasian ruffe. Both of these exotic species have been reported from other locations in Lake Huron, and are expected to colonize Saginaw Bay in the near future.

Mean length at age for yellow perch captured in trawls since 1990 indicate growth has improved substantially (Table 12). Both males and females are experiencing faster growth at all ages. This improvement in growth is likely a density dependent response to the dramatic decline in yellow perch abundance since 1989.

Growth rates of walleye collected in the gill net samples remains very fast compared to the state average (Table 13). This is ongoing confirmation that the walleye population in Saginaw Bay is well below carrying capacity. Condition of walleye, as indicated by relative weight, declined slightly from 1995 but remains good (Table 14). The proportional stock density (PSD) of walleye in Saginaw Bay remained high in 1996 indicative of the fast growth rates and low exploitation rates (see Study 436) (Table 15). The walleye population in Saginaw Bay continues to exhibit characteristics of a trophy fishery where abundance is low and growth rates are fast. Walleye food habits continue to show utilization of gizzard shad as principle dietary component in 1996 (Table 16).

Yellow perch abundance, as indicated by the 1996 gill net CPUE, increased substantially (Table 6). This is attributed to a strong 1994 year class (Tables 13 and 17). Yellow perch growth rates remained good for young fish (age one) but continued below the state average for all others in 1996 (Table 13). Despite the slow growth, condition improved for yellow perch in 1996 (Table 14). Population size structure, as indicated by proportional stock density, continues a trend towards being dominated by smaller individuals. This too may be a result of increased recruitment. White perch age structure suggests a strong 1995 year class (Table 17). The length/weight relationship for select species is presented in Table 18.

Job 2. Title: Process and analyze the data.

Findings: Analysis of the study data has been performed by Michigan Department of Natural Resources Fisheries Division personnel from the Alpena Great Lakes Fisheries Research Station, Mt. Clemens Great Lakes Fisheries Research Station and the Bay City District Office.

Job 3. Title: Prepare annual, final and other reports.

Findings: This annual report summarizes data from 1996 and those reported previously in performance reports since 1991 and fulfills the requirements of Job 3. A seven year project summary research report is anticipated for completion during the summer of 1997.

Literature Cited:

Anderson, R. O., and S. J. Gutreuter. 1983. Length, weight, and associated structural indices. Pages 283-300 in L. A. Nielsen and D. L. Johnson, editors. Fisheries Techniques. American Fisheries Society, Bethesda, Maryland.

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Haas, R. C. and J. S. Schaeffer. 1992. Predator-prey and competitive interactions among walleye, perch, and forage species in Saginaw Bay, Lake Huron. Research report number 1984, Michigan Department of Natural Resources, Fisheries Division, Ann Arbor.

Merna, J.W., J. C. Schneider, G. R. Alexander, W. D. Alward, and R. L. Eshenroder. 1981. Manual of fisheries survey methods. Fisheries Management Report No. 9. Fisheries Division, Michigan Department of Natural Resources, Ann Arbor.

Table 1.–Fall gill-net sampling locations for Saginaw Bay, Lake Huron, 1990-96.

Station	1990	1991	1992	1993	1994	1995	1996
Pt. Lookout	–	–	1	1	1	4	3
Pt. Au Gres	–	2	2	2	2	6	6
Saginaw River	–	–	–	–	–	–	–
Black Hole	3	2	2	2	2	6	5
Coreyon Reef	2	2	2	2	2	3	2
AuGres River	–	2	1	–	1	1	1
Fish Pt.	–	–	–	2	2	3	5
North Island	–	–	–	–	1	6	5
Oak Pt.	–	–	–	1	1	6	5
Charity Is.	–	–	–	–	–	3	2
Tawas	–	–	–	–	–	2	2
Total	5	8	8	9	12	40	36

Table 2.–Location of fall gill-net sampling effort in Saginaw Bay, Lake Huron, divided by inner and outer bay environments for 1990-96.

Location	1990	1991	1992	1993	1994	1995	1996
Inner	5	8	7	7	10	28	24
Outer	0	0	1	2	2	12	12
Total	5	8	8	9	12	40	36

Table 3.–Gill net CPUE comparisons between shallow sets and those traditionally performed (regular) for select species in Saginaw Bay 1995 and 1996.

	1996			1995		
Species	Shallow	Regular	P[1]	Shallow	Regular	P[1]
Northern pike	0.61	0.78	0.848	1.22	0.25	0.202
Channel catfish	0.00	7.61	0.009	–	–	–
Walleye	15.28	11.89	0.325	12.22	11.31	0.848
Yellow perch	87.89	29.18	0.002	36.97	18.50	0.022
White perch	25.78	7.64	0.017	0.92	4.00	0.058

[1] Independent sample t-tests, 2-tailed significance level for comparison of the means.

Table 4.-Common and scientific names of fishes mentioned in this report.

Common name	Scientific name
Alewife	*Alosa pseudoharengus*
Bluegill	*Lepomis macrochirus*
Burbot	*Lota lota*
Channel catfish	*Ictalurus punctatus*
Common carp	*Cyprinus carpio*
Emerald shiner	*Notropis atherinoides*
Eurasian ruffe	*Gymnouphalus cernuus*
Freshwater drum	*Aplodinotus grunniens*
Gizzard shad	*Dorosoma cepedianum*
Johnny darter	*Etheostoma nigrum*
Lake whitefish	*Coregonus clupeaformis*
Ninespine stickleback	*Pungitius pungitius*
Northern pike	*Esox lucius*
Pumpkinseed	*Lepomis gibbosus*
Quillback	*Carpiodes cyprinus*
Rainbow smelt	*Osmerus mordax*
Round goby	*Neogobius melanostomus*
Shorthead redhorse	*Moxostoma macrolepidotum*
Spottail shiner	*Notropis hudsonius*
Trout-perch	*Percopsis omiscomaycus*
Walleye	*Stizostedion vitreum*
White bass	*Morone chrysops*
White perch	*Morone americana*
White sucker	*Catostomus commersoni*
Yellow perch	*Perca flavescens*

Table 5.–Gill net CPUE comparisons between inner and outer bay environments for select species in Saginaw Bay 1995 and 1996.

	1996			1995		
Species	Inner	Outer	P[1]	Inner	Outer	P[1]
Northern pike	0.09	1.86	0.379	0.40	0.00	0.223
Channel catfish	11.18	2.00	0.041	–	–	–
Walleye	14.45	7.86	0.132	15.80	3.83	0.023
Yellow perch	118.45	39.86	0.007	19.40	17.00	0.805
White perch	37.00	8.14	0.025	5.20	2.00	0.232

[1] Independent sample t-tests, 2-tailed significance level for comparison of the means.

Table 6.–Catch summary from fall gill-net surveys of Saginaw Bay, Lake Huron, 1991-96. Catch-per-unit of effort (CPUE) is expressed as catch per 1000 m of net. Total effort in parentheses.

	1991 (2,438m)		1992 (2,438m)		1993 (2,745m)		1994 (3,353m)		1995 (3,658m)		1996 (4,267m)	
Species	Total catch	CPUE	Total catch	CPUE	Total catch	CPUE	Total catch	CPUE	Total catch	CPUE	Total catch	CPUE
Gizzard shad	420	172.1	21	8.6	92	33.5	45	13.4	47	12.9	207	48.5
Carp	1	0.4	17	7	5	1.8	13	3.9	3	0.8	9	2.1
Quillback	8	3.3	3	1.2	3	1.1	4	1.2	10	2.7	16	3.7
White sucker	499	205.0	975	399.6	358	130.4	443	132.1	218	59.6	464	108.7
White perch	229	93.9	15	6.1	31	11.3	318	94.8	105	28.7	398	93.3
White bass	26	10.7	14	5.7	10	3.7	1	0.3	13	3.6	7	1.6
Freshwater drum	27	11.1	89	36.1	53	19.3	86	25.7	38	10.4	59	13.8
Yellow perch	427	175.0	267	109.4	646	235.4	343	102.3	313	85.6	832	195.0
Walleye	689	283.4	171	70.1	381	138.8	163	48.6	161	45.1	180	42.2
Northern pike	4	1.6	6	2.5	0	0	5	1.5	4	1.1	1	0.2
Channel catfish	122	50.0	26	10.7	58	21.1	40	11.9	17	4.7	123	28.8

Table 7.–Catch and percent contribution of year classes of walleye from fall gill-net surveys, Saginaw Bay, Lake Huron, 1991-96.

Year class	Age	Percent	Catch per 1000 m	Age	Percent	Catch per 1000 m	Age	Percent	Catch per 1000 m
	1991			1992			1993[1]		
1993	–	–	–	–	–	–	0	–	0.0
1992	–	–	–	0	–	–	1	3.8	5.1
1991	0	3.3	9.4	1	18.1	12.7	2	28.6	38.6
1990	1	21.9	61.9	2	25.1	17.6	3	18.1	24.4
1989	2	25.4	71.8	3	14.7	10.3	4	21.0	28.4
1988	3	12.3	34.9	4	11.1	7.8	5	8.1	10.9
1987	4	9.9	27.9	5	10.6	7.4	6	6.5	8.7
1986	5	10.0	28.3	6	7.0	4.9	7	7.8	10.6
1985	6	9.9	27.9	7	8.1	5.7	8	4.8	6.6
1984	7	3.8	10.7	8	3.6	2.5	9	0.8	1.1
1983	8	3.1	8.6	9	0.6	0.4	10	–	0.0
1982	9	0.3	0.8	10	1.1	0.8	11	–	0.0
1981	10	0.1	0.4	11	–	–	12	0.3	0.4
Mean	3.1			3.5			3.9		
Total		100	282.6		100	70.1		100	138.8
	1994			1995[2]			1996[2]		
1996	–	–	–	–	–	–	0	–	–
1995	–	–	–	0	3.3	1.2	1	17.6	6.2
1994	0	1.3	0.6	1	23.5	8.9	2	29.0	9.8
1993	1	4.5	2.2	2	0.7	0.2	3	4.6	1.6
1992	2	8.4	4.1	3	8.6	3.2	4	3.1	1.1
1991	3	18.1	8.8	4	16.9	6.4	5	11.9	4.2
1990	4	21.9	10.6	5	18.5	7.0	6	12.3	4.3
1989	5	16.8	8.2	6	12.9	4.9	7	11.1	3.9
1988	6	16.1	7.8	7	8.3	3.1	8	5.4	1.9
1987	7	9.7	4.7	8	5.6	2.1	9	4.6	1.6
1986	8	3.2	1.6	9	0.7	0.2	10	1.5	0.5
1985	9	–	0.0	10	0.3	0.1	11	–	–
1984	10	–	0.0	11	0.7	0.2	12	–	–
1983	11	–	0.0	12	–	–	13	–	–
1982	12	–	0.0	13	–	–	14	–	–
1981	13	–	0.0	14	–	–	15	–	–
Mean	4.4			4.1			4.1		
Total		100	48.6		100	37.6			34.9

[1] Age distribution includes one age-13 fish, eleven walleyes unaged. Percent contribution based on aged fish only.

[2] Data based on expanded netting effort catch to provide a larger sample size. Total catch per 1000m therefore differs slightly from value reported in Table 3 which is based solely on catch from traditional netting locations.

Table 8–Location of trawl stations and number of tows performed in Saginaw Bay, 1990-95. All sampling was conducted in fall except where indicated otherwise.

Quadrant	Site description	1990	1991	1992[1]	1993[2]	1994	1995[3]	1996
Northeast	North Island & Wildfowl Bay	5	4	24	14	6	6	6
Southeast	Fish Point	4	4	19	13	3	9	6
Southwest	Pinconning	4	4	27	20	13	9	12
Northwest	AuGres	3	4	21	25	10	15	6
Total		16	16	91	72	32	39	30
Study total								311[4]

[1] Total number of tows includes 27 from each of May and July.
[2] Total number of tows includes 34 from July.
[3] Total for northwest quadrant includes 6 experimental trawls near Charity Islands
[4] Total for study includes 15 tows from 1989.

Table 9.-Mean catch-per-unit-of-effort (CPUE) of fish collected from trawling in Saginaw Bay, Lake Huron, 1990 through 1996 based on fall data only. Total number of tows are in parentheses. See Table 4 for complete listing of scientific names for each species.

Species	1990 (16)	1991 (16)	1992 (37)	1993 (38)	1994 (32)	1995 (39)	1996 (30)
Gizzard shad	45.1	49.4	0.3	19.3	8.5	6.2	22.9
Alewife	16.1	80.0	302.5	191.2	48.3	306.8	98.7
Rainbow smelt	47.1	43.7	280.2	467.9	57.9	22.4	15.2
Trout perch	133.1	165.5	199.9	416.4	512.5	513.5	474.1
Spottail shiner	194.5	124.1	182.0	96.8	203.5	372.6	209.5
Yellow perch	148.7	176.5	69.3	37.8	24.0	125.8	85.0
White sucker	11.1	12.3	7.6	10.3	9.8	7.0	7.7
Johnny darter	1.3	0.5	11.5	10.3	10.8	28.9	20.7
White perch	671.2	403.9	91.5	27.9	183.0	528.2	277.2
Walleye	1.5	5.5	1.1	1.3	1.2	0.9	1.3
White bass	3.6	6.0	0.1	1.8	6.1	1.0	0.4
Carp	5.3	3.1	2.9	3.3	8.8	6.9	4.4
Freshwater drum	23.1	24.6	2.8	8.7	27.8	28.3	16.3
Channel catfish	4.7	0.4	0.3	0.9	6.0	3.3	6.3
Bluegill	0.1	0.0	0.0	0.0	0.1	0.0	0.1
Quillback	0.3	0.4	0.1	0.6	0.6	0.6	0.6
Lake whitefish	0.2	0.0	0.1	0.0	0.0	0.8	0.1
Pumpkinseed	0.2	0.2	0.0	0.0	0.0	0.0	0.1
Emerald Shiner	44.9	14.8	9.3	0.7	0.0	0.0	0.9

Table 10.–Number of young-of-the-year yellow perch caught per ten-minute tow (CPUE) from Saginaw Bay, Lake Huron and their mean total length, fall 1970-96.[1]

Year	CPUE	Mean total length (mm)
1970	29.5	96.5
1971	20.2	91.4
1972	13.9	83.8
1973	30.6	91.4
1974	27.9	88.9
1975	247.9	88.9
1976	11.1	91.4
1977	52.9	91.4
1978	99.8	86.4
1979	166.7	78.7
1980	39.0	86.4
1981	71.3	83.8
1982	686.7	76.2
1983	251.9	76.2
1984	171.0	78.7
1985	147.8	78.7
1986	71.4	73.7
1987	131.5	81.3
1988	56.6	76.2
1989	252.8	71.1
1990	39.0	79.5
1991	110.8	70.2
1992	7.1	76.2
1993	0.5	90.7
1994	3.9	85.0
1995	98.9	117.3
1996	37.3	81.9

[1] Data prior to 1990 from Haas and Schaeffer (1992).

Table 11.-White perch catch from trawling effort, fall 1985-96, Saginaw Bay, Lake Huron.[1]

Year	Total catch	Number of tows	Number of minutes	Number per tow	Number per minute
1985	0	NA	NA	–	–
1986	606	167	1,457	3.6	0.42
1987	7,514	252	2,321	29.8	3.24
1988	41,427	248	2,181	167.0	18.99
1989	34,817	15	150	2,321.1	232.11
1990	10,739	16	158	671.2	68.97
1991	6,463	16	149	403.9	43.52
1992	3,295	36	360	91.5	9.15
1993	1,076	38	419	28.3	2.57
1994	6,062	32	320	189.4	18.94
1995	19,002	36	360	528.2	52.78
1996	8,130	30	306	271.0	26.6

[1] Data prior to 1990 from Haas and Schaeffer (1992).

Table 12.–Mean length (mm) at age for yellow perch from fall Saginaw Bay trawls, 1990-96.

	Survey year						
Age	1990	1991	1992	1993	1994	1995	1996
				Males			
Age 1	125	125	125	131	145	136	134
Age 2	146	147	150	156	158	170	171
Age 3	165	169	167	184	177	178	190
Age 4	175	185	182	198	191	195	204
Age 5	186	203	188	202	199	215	216
Age 6	195	215	207	197	200	221	224
Age 7	210	270	232	262	218	278	–
				Females			
Age 1	128	128	128	132	150	143	139
Age 2	157	155	159	170	173	179	184
Age 3	176	180	176	195	196	197	208
Age 4	199	205	206	211	214	216	220
Age 5	215	225	248	247	234	226	232
Age 6	235	250	249	246	246	246	278
Age 7	246	283	–	283	296	276	–

Table 13.–Mean length at age of walleye and yellow perch and by year for walleye from Saginaw Bay, Lake Huron, from fall gill-net data for 1990-96, compared with Michigan average lengths from October -December catches. Sample sizes in parentheses.

	Survey year							Michigan
Age	1990	1991	1992	1993	1994	1995	1996	average[1]
				Walleye				
0	228 (11)	238 (20)	–	–	208 (2)	224 (10)	–	180
1	348 (197)	361 (151)	320 (1)	306 (14)	348 (7)	346 (71)	352 (46)	264
2	444 (74)	444 (175)	438 (43)	410 (106)	426 (13)	398 (2)	437 (73)	353
3	495 (48)	504 (85)	500 (25)	465 (67)	473 (28)	470 (26)	478 (12)	401
4	537 (74)	536 (68)	535 (19)	516 (78)	520 (34)	501 (51)	537 (8)	447
5	553 (60)	557 (69)	548 (18)	537 (30)	537 (26)	543 (56)	517 (31)	488
6	552 (32)	571 (68)	588 (12)	552 (24)	564 (25)	555 (39)	582 (32)	523
7	580 (9)	590 (26)	611 (14)	580 (29)	613 (15)	572 (25)	568 (29)	549
8	607 (3)	611 (21)	638 (6)	601 (18)	612 (5)	590 (17)	579 (14)	569
9	–	635 (2)	652 (1)	620 (3)	–	596 (2)	619 (12)	586
				Yellow perch				
0	–	–	–	–	–	–	–	84
1	–	–	120 (1)	153 (5)	–	148 (93)	150 (34)	133
2	185 (1)	194 (3)	176 (8)	185 (11)	148 (6)	161 (44)	151 (193)	165
3	196 (8)	197 (56)	196 (61)	189 (80)	176 (29)	187 (47)	184 (91)	191
4	204 (28)	208 (100)	211 (69)	195 (71)	198 (98)	205 (101)	196 (85)	216
5	217 (31)	220 (52)	235 (37)	208 (28)	214 (82)	220 (32)	211 (82)	240
6	218 (14)	218 (11)	237 (20)	213 (16)	243 (21)	248 (10)	232 (31)	262
7	213 (13)	229 (3)	252 (4)	216 (5)	265 (2)	–	244 (12)	282
8	244 (6)	–	327 (1)	222 (2)	271 (1)	284 (1)	288 (2)	295
9	–	–	322 (1)	–	–	–	–	307

[1] From Merna et al. (1981).

Table 14.–Mean relative weight by length classes[1] and all sizes combined for walleye and yellow perch collected in gill nets from the falls of 1989 through 1996 from Saginaw Bay, Lake Huron. N=sample size for that year.

Year	Stock-quality	Quality-preferred	Preferred-memorable	All sizes combined	N
Walleye					
1989	100	95	95	96	259
1990	98	102	97	98	508
1991	95	96	95	96	689
1992	87	88	90	89	171
1993	91	91	88	90	382
1994	88	88	90	88	155
1995	92	93	92	95	302
1996	90	92	90	90	267
Yellow perch					
1989	NA	NA	NA	NA	NA
1990	98	97	92	97	101
1991	82	80	83	81	231
1992	82	86	86	84	202
1993	96	95	94	96	218
1994	99	96	92	96	203
1995	91	87	90	89	501
1996	96	93	90	95	1658

[1] See Table 15 for explanation of size classes.

Table 15–Walleye and yellow perch proportional stock density (PSD)[1] and relative stock density (RSD-P and RSD-M)[2] in parentheses from fall gill-net data for 1990 through 1996 from Saginaw Bay, Lake Huron.

Species	1990	1991	1992	1993	1994	1995	1996
Walleye	61(34,2)	79(40,3)	81(46,8)	93(40,3)	96(58,5)	76(55,3)	83(46,6)
Yellow perch	79(9,1)	69(12,0)	62(18,4)	45(3,0)	73(9,1)	38 (6,1)	22 (2,0)

[1] Stock and quality size for walleye is 250mm, 380mm, respectively, yellow perch: 130mm, 200mm. Range of PSD values suggested as indicative of balance when the population supports a substantial fishery is 30-60 for walleye and 30-50 for yellow perch (Anderson and Weithman 1978).

[2] Preferred size for walleye is 510mm, memorable size is 630mm. For yellow perch it is 250mm and 300mm, respectively (Anderson and Gutreuter 1983).

Table 16.–Food habits of walleye from fall gill nets from Saginaw Bay, Lake Huron, 1989-96. See Table 4 for a complete listing of scientific names for each species.

	Incidence		Frequency								
Year	No. stomachs examined	No. void	Unidentified fish remains	Gizzard shad	Yellow perch	Spottail shiner	Rainbow smelt	Alewife	Ninespine stickleback	White sucker	White perch
1989	257	66	105	242	0	0	1	30	3	0	1
1990	508	190	115	400	0	0	1	5	1	0	1
1991	669	240	199	368	2	2	0	9	0	1	0
1992	171	95	40	1	1	1	9	11	0	1	0
1993	371	195	88	134	0	0	1	4	0	0	0
1994	84	44	17	50	2	2	0	0	0	0	0
1995	291	131	128	115	6	2	0	152	0	2	3
1996	148	91	41	13	2	0	0	1	0	0	0

Table 17.–Age composition of white perch and yellow perch from the gill-net catch, Saginaw Bay, Lake Huron, 1991-96.[1]

	White Perch						Yellow Perch					
Age	1991	1992	1993	1994	1995	1996	1991	1992	1993	1994	1995	1996
0	1	–	–	27	3	–	6	–	–	–	–	–
1	92	13	5	151	57	102	–	1	5	–	93	34
2	4	2	15	15	1	31	3	8	11	6	44	193
3	1	–	4	11	–	3	56	61	80	29	47	91
4	–	–	3	4	–	2	100	69	71	98	101	85
5	–	–	1	6	–		52	37	28	82	32	82
6	–	–	–	–	–		11	20	16	21	10	31
7	–	–	–	–	–		3	4	5	1	–	12
8	–	–	–	–	–		–	1	2	23	1	2
Number aged	98	15	28	214	61	138	231	202	218	241	328	531
Mean age	1.05	1.13	2.29	1.67	0.97	1.31	4.09	4.09	3.84	4.73	3.20	3.26

Table 18.-Length/weight regression equations for select species based on 1996 fall gill-net collections in Saginaw Bay, Lake Huron. Logs are base 10 and weight (wt) is in grams, 1ength (len) is in mm.

Species	Equation	r^2
Walleye	log(wt)=3.117 log(len)-5.336	0.95
Yellow perch	log(wt)=3.1907log(1en)-5.3277	0.88
White perch	log(wt)=2.9726log(1en)-4.7409	0.85

Prepared by: David Fielder and Mike Thomas
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